Probl Cryobiol Cryomed 2022; 32(4):309
https://doi.org/10.15407/cryo32.04.309

Нейрони нюхового нейрогенного відділу щура: морфологічне дослідження

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Neurons of the Olfactory Neurogenic Region of the Rat: a Morphological Study

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Regulatory mechanisms of postnatal neurogenesis in the main neurogenic region of the olfactory system, in the subventricular zone (SVZ) and the rostral migratory stream (RMS), remain insufficiently explained despite a number of new findings. For the potential use of newly born cells in brain repair, it is necessary to understand these mechanisms. Recently found evidence suggests that neurogenesis in the SVZ/RMS neurogenic system could be regulated by neurons located directly in this region. To date, two cell populations showing the morphological characteristics of mature neurons have been identified in the RMS of the adult rat: nitric oxide (NO) producing neurons and neurons expressing secretagogin (SCGN). Using a cryomicrotome, we cut deeply frozen rat brains into thin sections in the sagittal plane to monitor NO+ and SCGN+ neurons in the SVZ/RMS. The sections were stored in PBS at 4 °C and the next day they were processed for immunohistochemical analyses. The aim of our work was to obtain new morphological data about these two populations of neurons in the olfactory system neurogenic region of adult rats. In order to expand our knowledge about the presence of neurons in the olfactory neurogenic region, we focused on the identification of NO and SCGN-producing neurons in the SVZ. We also analysed the distribution and the number of these cell types in individual parts of the RMS (vertical arm, elbow, horizontal arm). Based on double immunofluorescence labelling with nitric oxide synthase (nNOS) and SCGN, we examined the relationship between NO+ and SCGN+ cells in the migration pathway. Using microscopic analysis, we confirmed the presence of NO+ and SCGN+ neurons in the SVZ. NO+ and SCGN+ neurons were present throughout the RMS, but their distribution was uneven. Quantitative analysis showed a significantly higher number of SCGN+ neurons in the SVZ and also in all three anatomical parts of the RMS compared to the number of NO+ neurons in these areas. Regarding the colocalization of NO+/SCGN+ cells, according to our findings, NO+ cells and SCGN+ cells represent two separate populations of neurons. Differences in the number and distribution of SCGN+ and NO+ neurons in the SVZ/RMS area suggest a different functional significance of these neurons in the olfactory neurogenic region.

This project was supported by research grants: APVV-19-0279

Probl Cryobiol Cryomed 2022; 32(4):309
https://doi.org/10.15407/cryo32.04.309a

Харчування матері та нейрогенез

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Maternal Nutrition and Neurogenesis

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Obesity is one of the most serious and costly health challenges facing the modern world. Increasing evidence suggests that the risk of developing a metabolic syndrome or obesity may be influenced very early in the development, especially through inappropriate fetal and/or neonatal nutrition. Outcomes from epidemiological studies indicate that maternal nutrition during pregnancy and lactation periods has a profound impact on adult neurogenesis in the offspring. In this study, an intergenerational dietary model based on overfeeding of experimental mice during prenatal and early postnatal development was used to produce mice with various body conditions. The aim of the present study was to investigate the impact of the maternal high-energy diet during pregnancy and lactation periods on morphological characteristics of the olfactory neurogenic region involving the subventricular zone (SVZ) and rostral migratory stream (RMS). Besides that, the differentiation of nitrergic cells was evaluated. In order to explore the SVZ/RMS morphology and nitrergic cell differentiation, the thin sections from deeply frozen brains were cut on cryomicrotome. Subsequent histochemical and immunohistochemical labelling was performed on slices stored at 4°C, in order to preserve the immunoreactivity of the sample. Our findings indicate that, under the influence of a maternal high-energy diet administered during pregnancy and lactation, the thickness of SVZ/RMS neurogenic region is significantly increased, although the general morphological appearance of the mouse SVZ/RMS is not impacted in mice with various amount of body fat. The nitrergic cells were present in all evaluated anatomical parts in all groups of mice examined. The maternal high-energy diet administered during pregnancy and lactation caused significant changes in the number of nitrergic cells, but only in mice where extreme phenotypes, such as significant overweight/adiposity or obesity are manifested.

Supported by VEGA 2/0119/22
Supported by ERDF project ITMS 313011V455.